

Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 1-47 are pending in the application, with claims 1, 32 and 47 being the independent claims. Claims 1-46 stand rejected under 35 U.S.C. § 112, first paragraph as allegedly failing to comply with the written description requirement. Claims 17 and 18 stand rejected under 35 U.S.C. § 112, second paragraph for being indefinite. Claims 1-3, 11-16, 19, 24, 32-34, 41-44 and 46 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 5,005,419 to O'Donnell *et al.* (hereinafter "O'Donnell") or U.S. Pre-Grant Publication No. 2002/0143245 to Rather *et al.* (hereinafter "Rather"). Claims 4-10, 20-23, 25-31, 35-40 and 47 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over O'Donnell or Rather in view of U.S. Patent No. 6,134,006 to Telschow *et al.* (hereinafter "Telschow") or U.S. Patent No. 6,792,811 to Argento *et al.* (hereinafter "Argento").

Based on the above Amendment and the following Remarks, Applicant respectfully requests that the examiner reconsider all outstanding objections and rejections and they be withdrawn.

I. Claims 1-46 Satisfy the Written Description Requirement

Claims 1-46 stand rejected under 35 U.S.C. § 112, first paragraph as allegedly failing to comply with the written description requirement. For the following reasons, this rejection is respectfully traversed.

Claims 1 and 32 recite "light amplitude modulation detectors". Support for this claim feature may be found, *inter alia*, at page 11, lines 5-9 which state:

Th[e] changes in the received signals will in general have associated frequencies and amplitudes due to the vibrations of regions in the scene corresponding to the respective photodiodes (or pixels). Thus, an apparatus according to Figure 10 (with a detector array 300) is configured to spatially map the amplitudes and frequencies of vibrations on, e.g., the surface of an aircraft such as a helicopter 200.

Additional support for this claim feature may be found at page 9, line 27 to page 10, line 2 which state:

A suitable detector array 300 is shown in Figure 11, and in this embodiment may include a 16x16 photodiode array (PDA), thus including 256 elements, though larger or smaller arrays may also be used. As an alternative to photodiodes, the individual detectors may be CMOS devices or other opto-electronic devices as appropriate.

The Examiner argues “the ‘modulation’ of the light signals occurs due to the vibrations off of the target object and are not specific to a ‘light amplitude modulation detector’, as instantly claimed.” However, as described in the specification, the detector of the present invention may be any suitable detector for detecting amplitude-modulated light, as the apparatus may use the detected amplitude modulated light to “spatially map the amplitudes and frequencies of vibrations on, e.g., the surface of an aircraft such as a helicopter.”

Thus, claims 1-46 satisfy the written description requirement. Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claims 1-46 under 35 U.S.C. § 112, first paragraph.

II. Claims 17 and 18 Are Definite

Claims 17 and 18 stand rejected under 35 U.S.C. § 112, second paragraph for being indefinite. Specifically, the Examiner states that the claim term “the predetermined rate” lacks antecedent basis.

Applicant has amended claims 17 and 18 to depend from claim 16, which states “the detectors are configured to sample received signals at a predetermined rate.” In view of the foregoing, Applicant respectfully requests that the Examiner withdraw the rejection of claims 17 and 18 under 35 U.S.C. § 112, second paragraph.

III. Claims 1-3, 11-16, 19, 24, 32-34, 41-44 and
46 Are Patentable Over O'Donnell Or Rather

Claims 1-3, 11-16, 19, 24, 32-34, 41-44 and 46 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by O'Donnell or Rather. For the following reasons, this rejection is respectfully traversed.

Claim 1 recites “an array of light amplitude modulation detectors, each detector in the array configured to receive a *light signal* from a corresponding region of the target object” [emphasis added]. Claim 32 recites “receiving a *light signal* from each of a plurality of regions of the target object at a corresponding plurality of light amplitude modulation detectors” [emphasis added].

O'Donnell discloses a system for ultrasonic imaging a vibrating target (*see* col.8, ll.34-35). An ultrasonic transceiver array E_1 - E_N scans ultrasonic signals over individual points of a target object (*see* col.8, ll.46-51). Each array element then receives a reflected ultrasonic signal from the target point (*see* col.8, ll.51-59). The received ultrasonic signals are then processed to provide a display of each individually scanned point (*see* col.9, ll.49-54).

Rather also discloses an ultrasonic array 130 for receiving ultrasonic signals from a vibrating target (*see* ¶ 0030). Unlike O'Donnell, however, the system disclosed by Rather must insonify a target object (*see* Rather, FIGS. 4-6) with an acoustic signal and the ultrasonic receiver array must receive the ultrasonic signals after they have passed through the vibrating target (*see* ¶¶ 0031-33).

The present invention, as recited in claims 1 and 32, recite that a reflected “light signal” is received from a target and is detected using “light amplitude modulation detectors.” Neither O'Donnell nor Rather disclose or even fairly suggest the receipt and detection of *light signals* reflected by a target.

On the contrary, and as correctly pointed out by the Examiner (*see* Office Action, ¶¶ 6 and 8), O'Donnell and Rather disclose differing methods for detecting reflected *acoustic* (ultrasonic) signals. Ultrasonic signals are generally defined as acoustic signals with extremely high frequencies. In contrast, “light” may be generally defined as electromagnetic energy carried by photons. Additionally, light signals may travel in a vacuum of space whereas acoustic signals are incapable of propagating through a vacuum. Due to the inherent differences between the two

types of signals, the electronics required for detection and processing of ultrasonic signals are much different than those required for light signals and therefore neither O'Donnell nor Rather disclose or even fairly suggest the receipt of reflected "light signals," as recited by the claims.

Because O'Donnell and Rather both fail to disclose or suggest the claimed apparatus, including the receipt and detection of "light signals" from a target object, claims 1 and 32 are allowable over O'Donnell or Rather. Claims 2, 3, 11-16, 19, 24, 33, 34, 41-44 and 46 depend from claims 1 or 32 and are allowable for at least these reasons. Therefore, the Applicant respectfully requests that the Examiner withdraw the rejection of claims 1-3, 11-16, 19, 24, 32-34, 41-44 and 46 under 35 U.S.C. § 102(b).

IV. Claims 4-10, 20-23, 25-31, 35-40 and 47 Are Allowable
Over O'Donnell or Rather in View Of Telschow or Argento

Claims 4-10, 20-23, 25-31, 35-40 and 47 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over O'Donnell or Rather in view of Telschow or Argento. For the following reasons, this rejection is respectfully traversed.

As discussed above, O'Donnell and Rather both fail to disclose the use of "light signals." While the Examiner is correct in pointing out that Telschow and Argento both disclose optical systems for measuring vibration of an object, the combinations of O'Donnell or Rather in view of Telschow or Argento do not disclose or even fairly suggest all of the elements of claims 1, 32 or 47.

A. Claims 4-10, 20-23, 25-31, 35-40 and 47 Are
Allowable Over O'Donnell or Rather in View Of Telschow

Claim 1 recites "an array of light amplitude modulation detectors, each detector in the array configured to receive a light signal from a corresponding region of the target object and to generate an output representing the received signal; [and] a plurality of filters . . . configured to generate from the received output at least one filtered signal relating to a vibration of the corresponding region of the target object". Claim 32 recites "receiving a light signal from each of a plurality of regions of the target object at a corresponding plurality of light amplitude modulation detectors; [and] generating from each received signal a signal that is correlated to a

vibration of the corresponding region”. Claim 47 recites “an array of photodetectors . . . [and] a circuit coupled to each photodetector configured to isolate vibration signals from the light signals”.

Telschow discloses a system and method for measuring the vibration of an object that operates by mixing a reference beam 34 with a reflected light beam 28 (*see* FIG. 1). Once the signals are mixed, a two-way mixing process which uses a polarizer 46 and a photorefractive substance 44 to “select and discriminate” the diffracted signal, including the difference in frequency between the reflected signal and the transmitted signal (*see* col.6, ll.14-37). Only after the frequency difference is enhanced, a photodetector 50 is used to detect the beam and the results may be displayed to a user (*see* col.6, ll.51-55). All of the processing related to the vibration of the target is performed *prior* to detection by the photodetector.

As discussed above, O’Donnell and Rather operate by transmitting and receiving ultrasonic signals and by processing the ultrasonic signals after they are detected by an ultrasonic array. In contrast, Telschow operates by transmitting optical signals, extracting a frequency difference between the transmitted signal and the reflected signal and then detecting the frequency difference for display to a user. Because the processing principles are so different, an acoustic system disclosed by O’Donnell or Rather may not be modified to use optical signals as disclosed by Telschow. Any such modified system will not be operable because the processing electronics for acoustic and optical signals are completely different.

While the Examiner alleges that “it would have been obvious to one of ordinary skill in the art to have modified O’Donnell or Rather to include the detecting of an electromagnetic or light wave component of the received signals so as to better define and characterize the vibrating object image”, a modification of O’Donnell or Rather to use optical signals, as disclosed by Telschow, would not result in a functional imaging device. The processing components disclosed by O’Donnell and Rather would not be able to generate a usable output from the received light signals.

Because O’Donnell or Rather in view of Telschow fails to disclose or suggest the claimed apparatus including the receipt and detection of “light signals” from a target object, claims 1, 32 and 47 are allowable over either O’Donnell or Rather in view of either Telschow or Argento.

Claims 4-10, 20-23, 25-31 and 35-40 depend from claims 1, 32 or 47 and are allowable for at least these reasons. Therefore, the Applicant respectfully requests that the Examiner withdraw the rejection of claims 4-10, 20-23, 25-31, 35-40 and 47 under 35 U.S.C. § 103(a).

B. Claims 4-10, 20-23, 25-31, 35-40 and 47 Are
Allowable Over O'Donnell or Rather in View Of Argento

Claim 1 recites either “a plurality of filters . . . configured to receive the output from one of the detectors and to generate from the received output at least one filtered signal relating to a vibration of the corresponding region of the target object”. Claim 32 recites “generating from each received signal a signal that is correlated to a vibration of the corresponding region; [and] digitizing each correlated signal”. Claim 47 recites “a circuit coupled to each photodetector configured to isolate vibration signals from the light signals; [and] digitizing logic configured to digitize the vibration signals”.

Argento discloses a system and method for measuring the vibration of an object that operates by using a video camera to film the movement of a pair of parallel, spaced-apart marks located on the object (*see* col.4, ll.18-27). Once a recording of the vibration of the marks is received, a processing system measures the distance between the parallel marks to make a measurement of the amount of vibration of the target object (*see* col.4, ll.27-37).

The detection and processing principles disclosed by the O'Donnell and Rather systems detect and process ultrasonic signals and are completely different than the detection and processing principles disclosed by Argento, which detects and analyzes optical video signals. As discussed above, O'Donnell and Rather operate by transmitting and receiving ultrasonic signals and by processing the ultrasonic signals after they are detected by an ultrasonic array. In contrast, Argento measures target vibration by extracting the movement of a pre-calibrated target based on the recorded movement of two adhesive markers. Argento does not disclose any digital processing of the received video.

While the Examiner alleges that “it would have been obvious to one of ordinary skill in the art to have modified O'Donnell or Rather to include the detecting of an electromagnetic or light wave component of the received signals so as to better define and characterize the vibrating object image”, an acoustic system disclosed by O'Donnell or Rather may not be modified to use

optical video signals as the processing principles are so different. Any such modified system will not be operable. The processing components disclosed by O'Donnell and Rather would not be able to generate a vibration signal which may then be digitized, as recited by the claims.

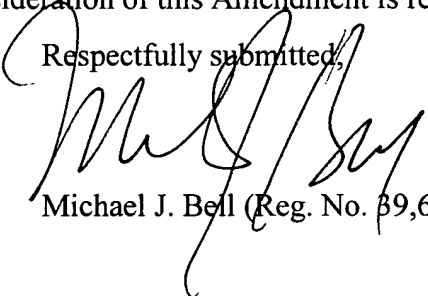
Because O'Donnell or Rather in view of Argento fails to disclose or suggest the claimed apparatus including the receipt and detection of "light signals" from a target object, claims 1, 32 and 47 are allowable over either O'Donnell or Rather in view of Argento. Claims 4-10, 20-23, 25-31 and 35-40 depend from claims 1, 32 or 47 and are allowable for at least these reasons. Therefore, the Applicant respectfully requests that the Examiner withdraw the rejection of claims 4-10, 20-23, 25-31, 35-40 and 47 under 35 U.S.C. § 103(a).

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. The Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicant believes that a full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment is respectfully requested.

Respectfully submitted,


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